Prof. Dr. Ralph Krupke

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Professor Molecular Nanostructures, Technische Universität Darmstadt
Research Unit Chair Charge Transport and Light-Matter Interaction in Carbon Nanosystems, Institute of Nanotechnology, Karlsruhe Institute of Technology
12. Juni 1968, Karlsruhe, male

Academic education and degrees

1996 – 1999	PhD in Physics, Tel Aviv University, 1999, Prof. Guy Deutscher
1989 – 1995	Diplom-Physik, Universität Karlsruhe, 1995, Prof. Hermann Rietschel and Dr. Jochen Geerk

Career since final degree

since 2013	Research Unit Chair, Institute of Nanotechnology, Karlsruhe Institute of Technology (KIT)
since 2011	Professor of Molecular Nanostructures, TU Darmstadt
2005 – 2010	Helmholtz-University-Young-Investigator-Group "Electronic and optical properties of molecular nanostructures", Institute of Nanotechnology, KIT
2000 – 2004	Postdoctoral Researcher at Forschungszentrum Karlsruhe

Research interest and key experience

- Charge transport and light-matter interaction in carbon nanosystems, 2D materials and molecular nanostructures for optoelectronics, photonics, high-frequency electronics and sensing applications
- Fabrication of functional devices; synthesis, sorting and assembling/integration of nanomaterials
- Experimental techniques: Dispersive and Fourier-transform photocurrent spectroscopy and imaging, electroluminescence spectroscopy and imaging, Raman spectroscopy and imaging, FTIR microscopy, semiconductor parameter analysis, electron transport, low temperature experiments, electron microscopy, electron-beam lithography, nanofabrication, dielectrophoresis.
- 80 publications in international journals with over 4000 citations, two book chapters, 5 patents, 52 invited talks, **H-factor 28** (Web of Science).

Selected publications (complete list at www.int.kit.edu/1245.php)

- Fully integrated quantum photonic circuit with an electrically driven light source, Khasminskaya S, Pyatkov F, Słowik K, Ferrari S, Kahl O, Kovalyuk V, Rath P, Vetter A, Hennrich F, Kappes MM, Gol'tsman G, Korneev A, Rockstuhl C, Krupke R, Pernice WHP, ***Nature Photonics*** 2016; published 26.09.2016
- Cavity-enhanced light emission from electrically driven carbon nanotubes, Fütterling F, Khasminskaya S, Flavel BS, Hennrich F, Kappes M, Krupke R, Pernice WHP. ***Nature Photonics*** 2016;10:420–427.
- Waveguide-Integrated Light-Emitting Carbon Nanotubes, Khasminskaya S, Pyatkov F, Flavel BS, Pernice WHP, Krupke R, ***Advanced Materials*** 2014;26:3465-72.
- Catalytic subsurface etching of nanoscale channels in graphite, Lukas M, Meded V, Vijayaraghavan A, Song L, Ajayan PM, Fink K, Wenzel W, Krupke R, ***Nature Communications*** 2013;4:1379.

- Probing the Nature of Defects in Graphene by Raman Spectroscopy, Eckmann A, Felten A, Mishchenko A, Britnell L, Krupke R, Novoselov KS, Casiraghi C., ***Nano Letters*** 2012;12:3925-30
- Light–matter interaction in a microcavity-controlled graphene transistor, Engel M, Steiner M, Lombardo A, Ferrari AC, v. Löhneysen H, Avouris P, Krupke R, ***Nature Communications*** 2012;3:906.
- Electroluminescence from a single nanotube-molecule-nanotube junction, Marquardt CW, Grunder S, Blaszczyk A, Dehm S, Hennrich F, v. Löhneysen H, Mayor M, Krupke R, ***Nature Nanotechnology*** 2010;5:863–7.
- Ultra-Large-Scale Directed Assembly of Single-Walled Carbon Nanotube Devices, Vijayaraghavan A, Blatt S, Weissenberger D, Oron-Carl M, Hennrich F, Gerthsen D, Hahn H, Krupke R, ***Nano Letters*** 2007;7:1556-60.
- Separation of metallic from semiconducting single-walled carbon nanotubes, Krupke R, Hennrich F, v. Löhneysen H, Kappes MM, ***Science*** 2003;301:344-7.

Patents

- US 8987705 B2, Carbon Nanotube Transistor Employing Embedded Electrodes, 24 Mar 2015.
- US 8859439 B1, Solution-assisted carbon nanotube placement with graphene electrodes, 14 Oct 2014.
- US 8610989 B2, Optoelectronic device employing a microcavity including a two-dimensional carbon lattice structure, 17 Dec 2013.
- EP 2362216 A1, Carbon nanotube SB-FET hydrogen sensor and methods for its manufacture and operation, 31 Aug 2011.
- US 7161107 B2, Method, arrangement and use of an arrangement for separating metallic carbon nanotubes from semi-conducting carbon nanotubes, 7 Jan 2007.

Awards

2012	IBM Pat Goldberg Memorial Award
2005	Helmholtz-Young-Investigator Award
2004	Erwin-Schrödinger-Award

Supervision and hosting of graduate students and postdoctoral fellows

- PhD students: 18, PostDocs: 9, Master/Bachelor students: 21, DAAD fellows: 2
- Alexander-von-Humboldt fellows Dr. A. Vijayaraghavan, Dr. B.S. Flavel, Dr. A. Felten
- Emmy-Noether-Group Dr. B.S. Flavel

Teaching activities and examinations

since 2011	At TU Darmstadt: Carbon Nanotubes and Graphene – from fundamentals to applications, evaluated lecture; Characterization methods of materials science; evaluated seminar Examination and evaluation of dissertations and theses at TU Darmstadt and KIT
2005 – 2010	At KIT: Superconductivity; Magnetism; Carbon Nanotubes and Graphene; Base quantities and base units; shared seminars. Magnetism and highly correlated electron systems; shared lecture

Miscancellous professional activities

- Reviewer of journals: Science, Nature, Nature Nanotechnology, Nature Communications, Nature Methods, Advanced Materials, ACS Nano, Nano Letters, Scientific Reports, Angewandte Chemie, Langmuir, Applied Physics Letters
- Reviewer of funding agencies: European Research Council (ERC), German Science Foundation (DFG)

- Spokes person of the subtopic carbon nanosystems of the Helmholtz program Science and Technology of Nanosystems (STN), since 2015
- Advisory board member of the International Conference on the Science and Application of Nanotubes, since 2015
- Member of the GDR-I Graphene and Nanotubes network, since 2015
- Editor for the Journal of Nanomaterials, since 2013
- Participant of the Helmholtz Management Academy Program, 2009
- Participant of the Junior Professional Management Program organized by the Zentrum für Wissenschafts-management Speyer e.V. and sponsored by the BASF, 2007 – 2008
- Material Research Society Spring Meeting Symposium "Science and Applications of Carbon Nanotubes Sym-posium", co-organizer 2005

Third party funding

Project Title	**Source**	**Amount**	**Period**
Piezoresistivity in nanocrystalline graphene	DFG	283k€	2017 - 2019
Tailoring supercurrent confinement in tunable superconducting weak links	DFG	210k€	2016 - 2018
Synthesis and Enrichment of Single-Chirality Carbon Nanotubes for Device Applications	BMBF	12k€	2015 - 2016
Waveguide integrated nanotube light sources	Volkswagen Foundation	512k€	2014 - 2017
Fourier-Transform Photocurrent-Spectromicroscope with Supercontinuum light source	DFG + State of Hesse	249k€	2012
Probing Electronic States in Dye Molecules by Scanning Tunnelling Microscopy and Carbon Nanotube Junctions	DFG	126k€	2010 - 2013
Controlling electron transport in carbon nanotubes with an optical microresonator cavity",	DFG	126k€	2008 - 2011
Electronic and optical properties of molecular nanostructures	Helmholtz Association	1,25M€	2005 - 2010

Media (since 2010)

KIT press release 132/2016 - Erster quantenphotonischer Schaltkreis mit elektrischer Lichtquelle

KIT press release 059/2016 - Nature Photonics: Light Source for Quicker Computer Chips

Neues aus der TU Darmstadt 19.04.2016 - Lichtquelle für schnellere Chips

Frankfurter Allgemeine Zeitung 05.03.2013 – Nanotechnik: Kein Tunnel der Welt ist kleiner

KIT press release 013/2013 - Nature Communications – Nanoparticles Digging the World's Smallest Tunnels

KIT press release 103/2012 - Play of Colors with Graphene

Frankfurter Allgemeine Zeitung 02.01.2011 - Eine Taschenlampe aus wenigen Molekülen

KIT press release 149/2010 - A Molecular Torch